

CLAIMS

What is claimed:

1. A system comprising:

a processor to process at least one collimated input beam to produce multiple time-delayed output beams, the input beam comprising at least one frequency, the multiple time-delayed output beams being mutually phase-shifted as a function of the at least one frequency of the input beam and being spatially distributed, whereby the at least one input beam is channelized into constituent frequencies; and

a subsystem to drop at least one wavelength from the at least one collimated input beam or to add at least one wavelength to the collimated input beam after the at least one input beam has been channelized.

2. The system of claim 1, wherein the processor comprises:

a first reflective surface, and

a second reflective surface, the second reflective surface having a reflectivity of less than 100%, the first reflective surface and the second reflective surface being in spaced relationship, whereby at least a portion of a beam directed toward the second surface is reflected multiple times between the first and second surfaces, thereby producing multiple time-delayed output beams exiting the second surface.

3. The system of claim 2, comprising:

an optical system to operate on the multiple time-delayed output beams exiting the second surface to channelize the at least one input beam into constituent frequencies.

4. The system of claim 1, wherein the subsystem comprises a port where light is selectively passed or reflected.

5. The system of claim 1, further comprising a mirror having at least one hole located at a same spatial location as a spatial location corresponding to a target wavelength to be dropped.

6. The system of claim 4, further comprising:

a fiber coupled to a target wavelength passed through the port; and

an optical device coupled to the fiber to receive the target wavelength passed through the port and to pass the target wavelength on another fiber optic path.

7. The system of claim 4, further comprising a detector to receive a target wavelength after the target wavelength passes through the port and to convert the target wavelength to an electronic signal.

8. The system of claim 6, wherein an optical signal to be added is coupled to a target wavelength at the optical device and the coupled wavelength passes back through the port and is coupled to an output fiber.

9. The system of claim 1, wherein the subsystem comprises a micro-electro-mechanical system having a plurality of micro-mirrors each positioned at a spatial location corresponding to a spatial location of the channelized input beam.

10. The system of claim 9, wherein at least one of the micro-mirrors is canted at an angle to reflect at least one target wavelength to an optical device.

11. The system of claim 10, wherein an optical signal to be added is coupled to the target wavelength at the optical device.

12. A method comprising:

providing at least one collimated input beam, the at least one input beam comprising at least one frequency;

processing the at least one input beam to produce multiple time-delayed output beams mutually phase-shifted as a function of the at least one frequency of the input beam and being spatially distributed, whereby the at least one input beam is channelized into constituent frequencies; and

adding or dropping at least one wavelength from the at least one collimated input beam after the at least one input beam has been channelized.

13. The method of claim 12, further comprising:

providing a first reflective surface,

providing a second reflective surface, the second reflective surface having a reflectivity of less than 100%, and

positioning the first reflective surface and the second reflective surface so that at least a portion of a beam directed toward the second surface is reflected multiple times between the first and second surfaces, thereby producing multiple time-delayed output beams exiting the second surface.

14. The method of claim 13, further comprising:

operating on the multiple time-delayed output beams exiting the second surface to channelize the at least one input beam into constituent frequencies.

15. The method of claim 12, wherein the dropping comprises:

providing a port where light is selectively passed or reflected, wherein separated wavelengths from the input beams pass through the port;

collecting each wavelength passing through the port by a coupled fiber;

passing the collected wavelengths through a combining/separating device for separating or combining a bi-directionally propagating light beam into separate uni-directionally propagating light beams; and

passing the each wavelength from the combining/separating device to a drop fiber.

16. The method of claim 15, wherein the combining/separating device is a circulator.

17. The method of claim 12, wherein the adding comprises:

providing a port where light is selectively passed or reflected, wherein separated wavelengths from the input beams pass through the port;

collecting each wavelength passing through the port by a coupled fiber;

passing the collected wavelengths through a combining/separating device for separating or combining a bi-directionally propagating light beam into separate uni-directionally propagating light beams;

coupling at least one an added wavelength to the collected wavelengths at the combining/separating device; and

passing the coupled wavelengths back through the port.

18. The method of claim 12, wherein the dropping comprises:

providing a first port where light is selectively passed or reflected, wherein separated wavelengths from the input beams pass through the first port;

passing the wavelengths which do not pass through the first port to a second port; and

passing the each wavelength which passes through the first port to a drop fiber.

19. The method of claim 12, wherein the adding comprises:

providing a first port where light is selectively passed or reflected, wherein separated wavelengths from the input beams pass through the first port; and

reflecting all wavelengths not passed through the first port to a second port where light is selectively passed or reflected;

receiving, at the second port, an optical signal carrying a frequency to be added to one of the wavelengths not passed through the first port; and

combining the optical signal to one of the wavelengths not passed through the first port.

20. The method of claim 12, wherein the adding comprises:

providing a linear array of micro-mirrors, each positioned at a spatial location corresponding to a spatial location of the channelized input beam;

receiving, at the plurality of micro-mirrors, all channelized input beams;

rotating the micro-mirror corresponding to the targeted wavelength to reflect the targeted wavelength to an optical system; and

coupling at least one an added wavelength to the collected wavelength at the optical system; and

passing the coupled wavelengths back to the respective micro-mirror.

21. The method of claim 14, wherein the dropping comprises:

providing a linear array of micro-mirrors, each positioned at a spatial location corresponding to a spatial location of the channelized input beam;

receiving, at the plurality of micro-mirrors, all channelized input beams;

rotating the micro-mirror corresponding to the targeted wavelength to be dropped to reflect the targeted wavelength to an optical system; and

passing the targeted wavelengths to a drop fiber.

22. An optical add/drop system comprising a demultiplexing/multiplexing subsystem select and recombine an appropriate wavelength and an add/drop apparatus to route the wavelength to a desired optical fiber output, wherein the demultiplexing/multiplexing subsystem channelizes a plurality of discrete input beams into their constituent frequency components at independent spatial locations and the add/drop apparatus can add or drop multiple wavelengths from multiple channels with separations between 50 MHz and 25GHz without using gratings or filters.